Barge Arrest System

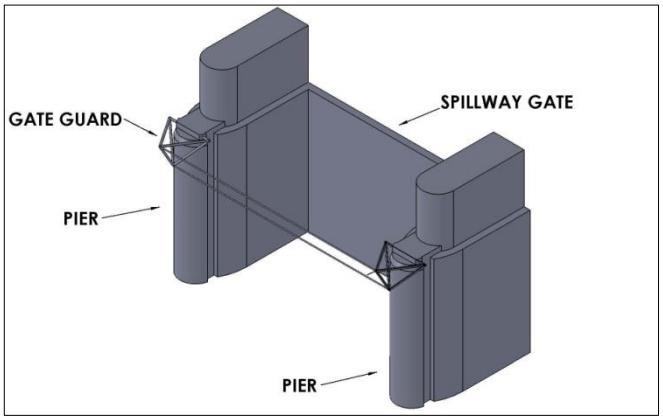
Problem

Recent closures of U.S. Army Corps of Engineers navigation projects attributed to tow/barge accidents have been costly to the towing industry due to closures and to the government due to expensive structural repairs. Cheatham Lock and Dam on the Cumberland River experienced such an accident in March 2002 (picture to right). Designers and operators of locks and dams need a means of arresting break-away barges and avoiding their impact on critical structural and mechanical components. A device to protect spillway gates from breakaway barges would be an asset to the Corps of Engineers.

Approach

Computing the impact force during the collision requires knowledge of the barge's mass and velocity. As a break-away barge approaches a structure, it travels with the velocity of flow near the structure. The initial focus of the gate guard design was determining a way to withstand the barge's impact load. Other factors contributed to the final concept: the guard could undergo a controlled deformation as the barge is brought to rest; the avoidance of the accumulation of debris or ice; and the method of deployment if the guard were positioned to allow rapid deployment. Also, navigation projects with large pool variations throughout the year require a structure be positioned for barge impact at lower pools, but not so low that at high water the barge simply floats over it.

Products



The device designed is a set of cables supported by tetrahedra placed on the spillbay piers of a navigation dam. When not deployed the tetrahedra sit on top of the piers and have no effect on the flow approaching the spillway gates or the flow near the structure, nor will they collect debris. During deployment, the tetrahedra rotate forward until they come to rest on the piers. Two cables connect each adjacent tetrahedron. These two cables work in conjunction to catch the vessel as it moves toward the spillway gate. A vessel floating toward a spillway gate will first impact the lower cable, which is designed to absorb the majority of the vessel's longitudinal momentum. The vessel may then start to slide over that cable. If this sliding occurs, the upper cable will limit the vertical movement until the vessel stops. Design details such as overall dimensions and mounting locations will need to be developed on a project-specific basis, and modifications will be required for sites having extremely large pool variations.

Benefits

This barge arrest system can be adjusted to not interfere with flow or catch debris when not in use, regardless of pool fluctuations. Preventing barges from impacting dam gates will prevent downtime for river traffic, loss of pool, and possible loss of cargo and lives – all of which contributes to cost savings and safer, more efficient waterways.

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